Evaluation of adequacy of investigations regarding contamination and threats to the Ogallala Aquifer

Summary Report

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As a primary source of drinking and irrigation water for many states, the Ogallala aquifer's local, regional and national importance is self-evident. Given this, the protection of the aquifer from contaminated sites such as Pantex must be a foremost priority. This report critiques the Department of Energy's (DOE) Ogallala groundwater efforts at Pantex.

The Ogallala Aquifer: A Low Priority for Pantex Environmental Restoration and Waste Management

The history of environmental restoration and waste management at Pantex do no reflect a primary focus on Ogallala contamination. During almost the entirety of DOE's cleanup mission at Pantex (1989-1999), DOE maintained that Pantex contamination had not reached, and likely would not reach, the Ogallala. In a letter to STAND in 1997, DOE stated,

> "…it is not a credible scenario that contamination will reach the Ogallala aquifer since hydrogeological data shows low potential for this to occur. Additionally, with the monitoring program in place at Pantex, any detect which indicates a need for interception of movement of contaminants to the Ogallala will cause immediate intervention on the part of DOE…" (DOE, 1997).

While Pantex had no evidence of contamination in the Ogallala, the potential for such contamination existed. In 1995, the Texas Bureau of Economic Geology published reports showing that perched groundwater would eventually migrate to the Ogallala aquifer (Bureau of Economic Geology, 1995).

Further evidence of a lack of focus on the Ogallala is its absence from the areas (known as SWMUs) included in Pantex's Environmental Restoration program. Threats to the Ogallala were perceived as secondary to the wastes present in soils and perched groundwater.

The lack of focus on the Ogallala aquifer was confirmed in the investigation conducted after trichloroethene (TCE) was detected in the Burning Grounds in May of 1999. DOE Office of Environment, Safety and Health stated in its investigation report that,

> "Pantex has concentrated its monitoring activities on the perched aquifer zones, since these are the principal areas where there is known contamination from site operations" (DOE, 2000).

Because the Ogallala had not been a priority for ten years, DOE was forced to play catch up in developing an appropriate response to the detection of contaminants. According to the ES&H report, Pantex was a long way from adequately monitoring the Ogallala. The reports key concerns included the following,

> "The Ogallala aquifer monitoring wells, site-wide, do not constitute an adequate network for early detection of contamination reaching the aquifer, from the perched zones, and the site-wide, groundwater surveillance monitoring system at Pantex needs to be improved to constitute a fully comprehensive site-wide network as required by DOE Order 5400.1" (DOE, 2000).

The report went on to state that Pantex's planned groundwater improvements, if implemented, would still not ensure compliance with DOE's own internal rules.

Importance of Protecting the Ogallala Aquifer

Pantex's mission is straightforward enough; according to the ER SWMU Reference Guide,

> "Pantex is tasked with conducting all operations in such a manner as to protect the environment and the health and safety of employees and members of the general public" (DOE, 1996).

An important step in protecting the environment, workers and the public is identifying potential health and safety risks. Pantex has initiated work toward quantifying risks in its draft Baseline Risk Assessment (BRA). The BRA assesses risks posed by waste sites to determine the extent of cleanup required to adequately protect public, worker and environmental health and safety (Battelle, 1999). The Draft BRA quantified health risks to workers and the public from exposure to contaminants in air and in water.

The results of the BRA showed that almost all the risks associated with Pantex contamination are related to groundwater exposure—and much of this risk is related to exposure through utilizing Ogallala aquifer water for drinking, washing or irrigating.

Given the initial BRA results, aggressive action aimed at protecting the Ogallala aquifer is clearly the appropriate course.

Protecting the Ogallala Aquifer

Many DOE sites have vexing groundwater contaminant challenges. Investigating and remediating groundwater at DOE sites has proven technically complex and oftentimes politically loaded. In many cases, DOE's groundwater efforts have proven universally unsatisfactory—to DOE, contractors, regulators and the public.

The lack of satisfaction with DOE's groundwater efforts stem from several of the following characteristics of many DOE sites:

- Much of the groundwater contamination is a result of *decades* of weapons activities at sites. As a result, the contamination problems can be extensive—both in terms of areal extent and contaminant concentrations.
- Decades of unregulated activities has left many DOE sites with a great breadth and depth of cleanup problems and issues. As a result, priorities have often focused on the "low hanging fruit" cleanup activities. Expensive and technically difficult, groundwater remediation is often a much lower priority.
- The contaminants at DOE sites are often unique or, at the very least, rare. Without a signficant database of groundwater problems similar to those at DOE sites, technologies often do not exist to treat DOE's contaminants.
- DOE has many priorities competing with groundwater protection and remediation—some, such as continued waste disposal, actually worsen the contamination problems. In other words, DOE does not always hold groundwater protection as a high priority.

To summarize, in some cases DOE *cannot* adequately address groundwater and, in some cases, DOE has *chosen not* to adequately address groundwater. When deciding on an approach to groundwater, the distinction between what can be done and what cannot be done is critical.

A Successful Groundwater Program

In determining how to best protect the Ogallala aquifer, it is useful to view DOE's decade-plus of cleanup history with an eye toward what has worked and what hasn't worked. Over the past decade, several characteristics of successful groundwater programs have emerged at DOE sites.

- **Successful groundwater programs are comprehensive:** Successful groundwater programs consider existing groundwater contamination as well as all continuing site activities that might impact groundwater.

- **Successful groundwater programs are underpinned by an public dialogue and transparent decision-making process concerning groundwater priorities and activities.** Groundwater decisions are, by their very nature, are value-laden. An understanding of the values of the community (DOE, regulators, contractors, stakeholders, etc.) is critical in making the right decision concerning balance between defining what investigations and actions should be pursued.

- **Successful groundwater programs spend resources on activities that will have the most impact.** This charcteristic seems obvious. However, it is more difficult in practice than it appears on the surface. The nature of DOE's groundwater challenges necessitates approaches that initially may not seem wise. For example, technology limitations may render a serious groundwater threat as essentially untreatable. In this case, despite being a serious problem, the wise decision may be to spend resources on a less serious threat for which a treatment technology exists. It is these sorts of tradeoffs that, without a public dialogue and transparent decision-making process, are extremely difficult to implement.

Ideally, the above characteristics will lead to a consensus on the (1) identification of threats to the Ogallala; and (2) the appropriate decisions to address those threats. Following is an examination of the decisions (or de facto decisions) DOE has made at Pantex on these issues.

Ogallala aquifer monitoring

Since the discovery of contamination in the Ogallala aquifer, the monitoring network in the Ogallala has expanded dramatically. Prior to the discovery, Pantex monitored wells in the Ogallala aquifer at 14 locations (DOE, 2000). The network has since been expanded to 26 wells. Most of the new wells are found near the Burning Grounds.

In 2000, a DOE report compared the location of Ogallala wells with the locations of waste sites and concluded,

> "…that little or no ground water monitoring data has been collected at certain areas to determine whether the Ogallala aquifer has been affected….it is not possible to determine whether existing contaminant plumes are being detected" (DOE, 2000).

Pantex simply didn't have enough wells in the right places to determine Ogallala contamination and comply with DOE Order 5400.1's requirement for a comprehensive monitoring network.

In contrast with the two dozen monitoring wells at Pantex, Brookhaven National Laboratory which is about 1/3 the size of Pantex has nearly 500 monitoring wells (DOE,

2000). Hanford, which is nearly 25 times the size of Pantex maintains a well density of nearly twice that of Pantex.

The first step toward a comprehensive groundwater strategy at Pantex would be the development of a comprehensive monitoring network to comply with DOE Order 5400.1 and ensure that existing and future Ogallala contamination can be detected with reasonable surety. The network's compliance with DOE Order 5400.1 should be independently verified by an expert panel (see Recommendations).

Do No More Harm

The concept of "doing no more harm" has been a particularly important underlying concept of Hanford's cleanup—especially as it applies to groundwater protection (DOE, 1993). At Hanford, the concept led to the complete cessation of liquid discharges to the soil prior to 1995. While much of the discharge was little more than cooling water, it was serving as a hydraulic force to move existing soil and groundwater contamination toward the Columbia River. The cessation of these discharges remains one of Hanford's foremost cleanup successes. Moreover, it was technically straightforward and affordable and enjoyed a great deal of support throughout the stakeholder and public communities.

Doing no more harm at Pantex involves two important actions. First, reducing the amount of contamination that could potentially contaminate the Ogallala aquifer. Locating, identifying, and removing/isolating this contamination from the aquifer is critical.

The second action is ceasing activities that threaten the Ogallala aquifer. A prime example of this is ongoing discharges or disposal of wastes (liquid, in particular) that both increase the contamination potential of the Ogallala and provide a driving force for existing contamination to enter the aquifer.

The practical implementation of the above two actions requires, (1) Successful implementation and closure of Pantex Plant's Environmental Restoration; and (2) Eliminating discharges to Playa 1.

Ceasing discharges to Playa 1 is not a new idea. Pantex Plant's Wastewater Discharge Permit required a study to the determine the feasibility of eliminating or minimizing discharges to playa lakes and open ditches (DOE, 1996b). That means, by June of 1997, such a study would be complete and presumably lead to a cessation of discharges to Playa 1.

The point is not the specific study, but, rather, that this obvious, straightforward idea has not been implemented since the cleanup began in 1989. The continued discharge is a prime example of continuing to do harm—the discharge likely complicates the existing perched aquifer pump-and-treat project as well as increases the potential of Ogallala aquifer contamination.

Environmental Restoration at Pantex Plant

Completing environmental restoration at Pantex Plant fundamentally involves steps: Investigating the types and amounts of contaminants present in waste sites and, subsequently, implementing measures to protect humans and the environment from the contaminants. Such protection may take the form of contamination isolation or removal measures.

A great deal of environmental restoration work involves sampling, analysis and decision-making pertaining to what to do about a contamination problem. This involves not only DOE-Pantex, but also regulatory agencies responsible for ensuring DOE's decisions result in an environmental restoration program compliant with environmental laws.

> "According to the best available information, the majority of the ER activities are expected to be completed by the year 2000" (DOE, 1996b).

The above quote belies a fundamental truth about Pantex Plant: The Environmental Restoration process at Pantex has been plagued by delays. For example:

- From 1996 to 1998, Pantex claimed that site assessments would be completed in 1999, and corrective measures would be completed in 2000. By 2002 surveillance and maintenance costs, essentially associated with groundwater would be transferred to the Pantex Plant 'site landlord' (DOE, 1998).
- In 1999, Pantex claimed that it would be delisted from the Superfund National Priorities List in the year 2000 (DOE, 1999).
- Pantex's existing baseline sites 2014 as the year the cleanup will be complete and turned over for long-term surveillance and monitoring (DOE, 2002)
- Pantex has proposed 'accelerations' that would result in investigations being completed and corrective measures initiated by 2005. Under this acceleration, cleanup sites would be turned over from long term surveillance and monitoring in 2008 (DOE, 2002)

In other words, in the last four years, the date for completion of environmental restoration at Pantex has been moved from 2002 to 2014 to 2008.

Legitimate reasons exist for delays in cleanup—discovery of contamination in the Ogallala is one. Other bureaucratic, budgetary, or technical unknowns can result in justified delays.

Still, by failing to aggressively manage the Environmental Restoration program to a satisfactory closure, Pantex has indirectly failed to adequately address threats to the Ogallala and, through delays, created additional threats to the aquifer.

Recommendations for Ogallala aquifer protection

Following are recommendations aimed at adequate protection of the Ogallala that should be pursued by Pantex Plant as soon as possible.

- **Close existing characterization data gaps**, including:
  - The extent and source of Volatile Organic Compounds in the Burning Grounds. According to the SPR for Groundwater Investigations, the nature and extent of VOC's in the Burning Grounds "cannot be defined at this time as a result of insufficient data" (Stoller, 2001).
  - The interactions between the perched aquifer, fine grained zone and the Ogallala. Again, according to the SPR (Stoller,2001) for Groundwater Investigations,

    > "Structural and lithologic variances in the FGZ and the impacts to the Ogallala aquifer have not been completely delineated…" (Stoller, 2001).

- **Cease discharges to Playa 1:** While bureaucratic machinations toward this goal have been ongoing for years, real action toward a cessation of discharges remains perpetually on the horizon. It is time to make this straightforward aquifer protection action a reality.

- **Develop a comprehensive Ogallala monitoring network:** This network should be part of a comprehensive groundwater strategy focused on compliance, appropriate balance between characterization and action, and integrated protection of groundwater at Pantex.

- **Complete Environmental Restoration investigations and corrective actions expeditiously and with a focus on protection of groundwater.**

- **Establish an independent expert panel focused on advising the plant on groundwater activity priorities.** Given limited budgets, such a panel is critical in ensuring that funds are spent on high priority activities. Moreover, as budgets change and activities are implemented, the panel will allow Pantex to be nimble in adjusting its groundwater program accordingly. In this way, the Plant can ensure it is implementing an efficient, effective and comprehensive groundwater strategy. Lastly, the panel also provides a focal point for an open dialogue on groundwater issues, tradeoffs and priorities.

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